Tileable low-crosstalk 3D-integrated superconducting circuits

Peter Leek

University of Oxford, UK

peter.leek@physics.ox.ac.uk

Superconducting circuits are a leading candidate for the realization of practically useful quantum computers, in particular for near-term applications which may already be reached with circuits consisting of a few hundred qubits operated at high fidelity. Until recently, the topology of superconducting circuits has typically been constrained to two dimensions, which becomes difficult to scale as the number of qubits increases and signal wiring is needed for qubits in the middle of large arrays. In this talk I will present our progress [1] on scaling up a novel circuit architecture that builds on a tileable superconducting circuit unit cell with coaxial symmetry and 3D-integrated off-chip wiring [2], which provides a viable route to operating such large qubit arrays while maintaining a clean microwave environment [3].

References

[1] Spring et al., Science Advances 8 (2022)
[2] Rahamim et al., Applied Physics Letters 110, 222602 (2017)
[3] Spring et al., Physical Review Applied 14, 024061 (2020)